of the known III. type stars, but only in the case of the following have I been led to suspect a spectrum with bright lines. If the bright lines really exist in these stars they are very difficult objects. The full aperture of the $17\frac{1}{4}$ reflector is not sufficient really to deal with them satisfactorily.

		1855.		
(1)	Südl. D.M. $-12°\cdot1092$	$\alpha =$ V. 4 36·9	$\delta -12°$ 1·8	Mag. 6·5
(2)	D.M. $+39°\cdot3476$	XVIII. 33 19·2	$+39°$ 32·8	,, 6·5
(3)	D.M. $+49°\cdot2999$	XIX. 20 44·2	$+49°$ 57·0	,, 7·5

No. 1 was observed on October 30, 1888, only. The spectrum strongly resembles that of *Mira*.

No. 2 was observed on several nights; on two the bright lines were thought doubtful, on one pretty certain.

No. 3.—Observed on several nights, and on each occasion the bright lines suspected.

Height of a Perseid Fireball. By W. F. Denning.

On August 13, 1888, at $11^h\ 33^m$, while watching for shooting stars, I saw a large fireball low in the northern sky. In the earlier part of its flight its magnitude was not considerable, but towards the end it suddenly blazed up with intense brilliancy, and illuminated the whole hemisphere with a flash like lightning. In the brighter part of its path a streak was left, and this remained perceptible about forty seconds. I carefully registered the visible arc of the meteor's course as follows: $113°+57\frac{1}{2}°$ to $126°+52\frac{1}{2}°$. This position lies between the constellations of *Ursa Major* and the *Lynx*, in a region comparatively bare of conspicuous stars.

Mr. David Booth at Leeds partially observed the phenomenon. He was looking towards the north-eastern sky for late Perseids when he was startled by a brilliant flash, which he immediately attributed to vivid lightning, but, on quickly turning round to the west, he noticed a very bright meteor streak projected amongst the stars of *Draco*. Its terminal points were $275°+67°$ and $260°+53°$, and he correctly assumed it to have been left by a fine Perseid. Though straight at first the streak soon became irregularly bent, and after a gradual decadence, occupying three minutes, it finally disappeared.

Mr. Monck at Dublin also saw the same meteor, and approximately noted its flight as from the direction of *β Persei* to 41 *Arietis*; but there were many clouds about in the region of its appearance, which rendered the observation a little uncertain.

He describes the fireball as exceptionally bright, and noticed the decided flash near its extinction.

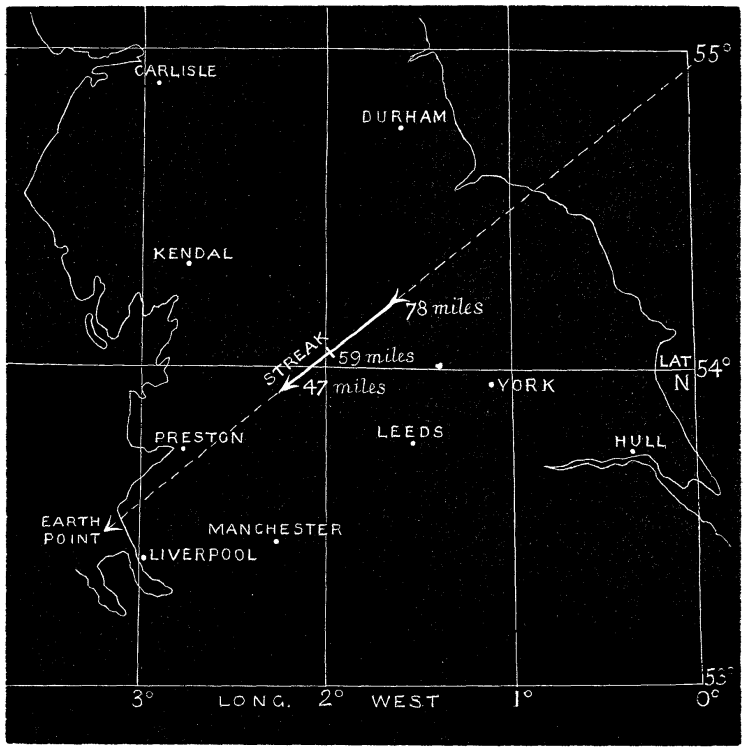
Several observers at Birmingham and other places have furnished accounts of this object, but only in general terms, and they do not supply any precise data that may be employed in determining the fireball's real path in the atmosphere.

Mr. R. Parke Buckley, of Birmingham, writing on August 14, says, "I witnessed a most extraordinary occurrence in the sky at 11.30 last night. By the stars called Charles's Wain a comet, looking in the sky about 6 feet long by 2 feet, flashed suddenly on the stars forming the square part of the waggon, and lasted for about three minutes, gradually dying away." Mr. H. Basnett, of the same city, says that at 11.30 P.M. he saw what he thought was lightning, but it lasted too long. Everything around he could see quite plainly, as if it were daytime. Looking up at the sky, he noticed a long line of fire, and this lasted quite three minutes.

At Leeds and Bristol the enduring streak enabled the direction of the fireball's flight to be recorded with great precision; and when these observations are compared together they show a very satisfactory accordance. The radiant is indicated at $43°+56°$, near η *Persei*. This point was in azimuth N. 49° E., altitude 42° at the time of observation. At Bristol the streak extended from $121°+54\frac{3}{4}°$ to $126°+52\frac{1}{2}°$; and combining this with its apparent place as noted at Leeds, I find it was suspended vertically over Yorkshire at heights ranging from 59 miles (above a point two miles south of Grassington) to 47 miles (above Gisburn). Its length was 18 miles. But the nucleus of the fireball became visibly incandescent at a much earlier period of its flight through the air than that intimated by the streak, which simply marked the section of its course where it attained its highest degree of combustion and where its material became dissipated. When first seen at Bristol in $113°+57\frac{1}{2}°$ the meteor was situated above a point three miles north-east of Masham, in the North Riding of Yorkshire, and here it had an elevation of 78 miles. The whole observed path shows therefore a descent from 78 to 47 miles, as follows:

When first observed at Bristol	78 miles high
Beginning of light streak (Leeds and Bristol) ...	59 ,, ,,
End of meteor and light streak (Leeds and Bristol)	47 ,, ,,
Entire length of observed real path (Bristol) ...	46 ,, ,,
Inclination to horizon (Leeds and Bristol) ...	42 degrees

The observation at Dublin, if included, would somewhat increase these heights, but the conditions prevailing there were unfavourable. The materials derived from Leeds and Bristol mutually corroborate the assigned path very closely, and they are sufficient for the present purpose.



Path and Heights of a Perseid Fireball, 1888, August 13, $11^h\ 33^m$ (W. F. D.).

This meteor was evidently typical of the large fireballs occasionally discharged by this well-known system. The radiant at 43°+56° is slightly erratic for the date. On the same night (August 13, 1888) the Perseid radiant was independently determined, from other meteors seen by myself, at 52°+57°, and by Mr. Booth at $51\frac{1}{2}°+56°$. On August 13, 1885, I found it at 51°+58°, and on August 13, 1880, at $49\frac{1}{2}°+57\frac{1}{2}°$. The mean of all these is at 51°+57°, which is 4° east of the fireball radiant. The difference is not large, but it can scarcely be accounted for by errors of observation, as they are likely to have been almost nil. The fireball itself was probably discordant to the extent referred to, for the Perseid radiant was not nearly as well defined as usual this year. There appear to be annual variations, not only in the richness of the display, but in the character of its radiation. In some years it is very precise, in others its diffusion is equally marked.

Bristol: 1888, *October* 15.

A Table of the Positions of Observatories, with Constants useful in Correcting Extra-Meridian Observations for Parallax. By Lieut.-General Tennant, R.E., F.R.S.

The discontinuance of old Observatories and the formation of new ones renders the occasional revision of such tables as the present one desirable. The extension of the electric telegraph has facilitated the determination of longitudes, so that the results recently published may be considered practically perfect as regards both elements of position: I hope therefore that the places I now give may require, except in one or two cases, little amendment.

Starting with Mr. Lancaster's "Liste Générale," I have omitted some Observatories which never should have been admitted as astronomical establishments, such as Calcutta and Bombay. Then I have examined the positions with the *Berliner Jahrbuch*, *Connaissances des Temps*, *Nautical Almanac*, and *American Nautical Almanac*, preferring each authority for the places of its own nation. A few corrections have been made from the *Monthly Notices* and other sources, and some new Observatories have been added, as well as some omitted, which I had no reason to suppose were very active. For the places of Mr. Brooks's new Observatory (Smith Observatory) at Geneva I am indebted to that gentleman. But I have not been able to get the position of the new Dearborn Observatory, and we now hear that the establishment at Edinburgh is to be moved, but it is useless to wait till changes cease.

In computing the constants I have used Col. Ross Clarke's figure of the Earth, which is certainly the best known, and I have used 8″·78 for the Mean Solar Parallax. The table is otherwise only a recomputation and slight extension of the corresponding one in Oppolzer's *Lehrbuch*, vol. i. The figure of the Earth makes but slight changes, but it is otherwise with the Solar Parallax. The value I have taken is a very small one, so that a constant addition to the last three logarithms will correct to any value likely to be preferred: Newcomb's parallax requires an addition of 0·0034.

The formulæ I have used are Oppolzer's:

$$\tan \phi_1 = \frac{b}{a} \tan \phi \; : \; \tan \phi' = \frac{b}{a} \tan \phi_1; \; \log \frac{a}{b} = 9{\cdot}9985176.$$

$$A = \frac{\pi}{15} \cos \phi_1; \; D = \pi . \frac{b}{a} \sin \phi_1;$$

and I have added

$$P = \pi . \frac{\cos \phi_1}{\cos \phi'}, = h\pi \text{ of Oppolzer,}$$

which is used to correct the solar places in computing orbits.